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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,044	02/27/2004	Kie Y. Ahn	1303.070US2	8340
21186	7590	02/23/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH 1600 TCF TOWER 121 SOUTH EIGHT STREET MINNEAPOLIS, MN 55402			MENZ, DOUGLAS M	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/789,044

Applicant(s)

AHN ET AL.

Examiner

Douglas M. Menz

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 5-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2/6/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over VanDover (US 6093944) in view of Scobey et al. (US 6115401).

Regarding claim 1, VanDover discloses an electronic device comprising:

A substrate (Col. 4, line 24 – Col. 5, line 19); and

A dielectric layer disposed on the substrate (Col. 4, line 24 – Col. 5, line 19), the dielectric layer containing a  $\text{TiO}_2$  layer doped with a lanthanide (Col. 3, lines: 39-53 and Col. 5, lines: 21-48).

VanDover further discloses that the  $\text{TiO}_2$  layer is formed by a reactive sputtering method and that other methods may be used, such as ion beam sputtering (Col. 8, lines: 30-39). However, VanDover does not explicitly disclose wherein the  $\text{TiO}_2$  layer is formed by ion assisted electron beam evaporation.

Scobey discloses that dielectric layers of metal oxide materials can be produced by commercially known plasma deposition techniques, such as ion assisted electron beam evaporation and ion beam sputtering and further that both methods produce advantageously dense and stable materials (Col. 10, lines: 50-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form VanDover's  $\text{TiO}_2$  layer by ion assisted electron beam evaporation, as taught by Scobey (Col. 10, lines: 50-67) instead of by ion beam sputtering, since Scobey explicitly teaches that ion assisted electron beam evaporation can be used in place of ion beam sputtering to produce metal oxide layers that are advantageously dense and stable (Col. 10, lines: 50-65).

Since oxygen is a constituent of  $\text{TiO}_x$ , it is inherent that an oxygen content is supplemented during the formation process of the  $\text{TiO}_x$  layer doped with the lanthanide.

Regarding claim 2, VanDover further discloses wherein the lanthanide has a concentration in the dielectric layer of between about 10% and about 30% of the dielectric layer (Col. 3, lines: 39-50).

Regarding claim 3, VanDover further discloses wherein the dielectric layer has a dielectric constant of greater than 45 (Col. 8, lines: 60-61), which would include applicant's claimed dielectric constant range of about 50 to about 110.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over VanDover (US 6093944) in view of Scobey et al. (US 6115401) as applied to claim 1 above, and further in view of Gardner et al. (US 6225168).

Regarding claim 4, VanDover in view of Scobey disclose the limitations of claim 1 as mentioned above, however they do not explicitly disclose that the dielectric layer has an equivalent oxide thickness ( $t_{eq}$ ) in the range from about 1.5 Angstroms to about 5 Angstroms.

Applicant specifically defines the term " $t_{eq}$ " on page 6, lines: 9-12 of the specification, which is further expressed by the mathematical relationship given on page 7 of the specification.

Using Applicant's definition and mathematical relationship, the Examiner has concluded that a  $t_{eq}$  in the range from about 1.5 Angstroms to about 5 Angstroms would correspond to  $TiO_2$  dielectric layer having a physical thickness range of about 17

Angstroms to about 57 Angstroms with a dielectric constant of 45, however, VanDover's dielectric constant can be greater than 45 (Col. 8, lines: 60-61). For example, if VanDover's dielectric constant is 100, then the physical thickness range would be about 38 Angstroms to about 128 Angstroms.

Therefore, in order to satisfy the limitation of claim 4, the Examiner must show a physical thickness of the TiO<sub>2</sub> layer to be greater than 17 Angstroms.

VanDover's specific application example is directed to a capacitor, which requires the thickness of the dielectric to be a function of the capacitance. However, VanDover expressly discloses that the dielectric can be used for MOSFET gate dielectrics (Col. 4, line 30).

Gardner discloses a MOS transistor with a TiO<sub>2</sub> gate dielectric, wherein a suitable thickness for the TiO<sub>2</sub> gate dielectric layer ranges from about 15 Angstroms to about 400 Angstroms (Gardner Col. 3, lines: 20-25).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate VanDover's dielectric material into a MOSFET gate dielectric with Gardner's dielectric thickness range since both dielectrics are composed of TiO<sub>2</sub> and since VanDover expressly discloses that the dielectric can be used for MOSFET gate dielectrics (Col. 4, line 30).

### ***Response to Arguments***

Applicant's arguments filed 1/5/06 have been fully considered but they are not persuasive. Applicant has amended claim 1 to include the limitation that an oxygen

content is supplemented during formation of the TiOx layer and further argues that the combination of VanDover and Scobey does not teach such a limitation. As mentioned above, it would be inherent that an oxygen content is supplemented during the formation process of the TiOx layer since oxygen is one of the constituents of TiOx.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas M. Menz whose telephone number is 571-272-1877. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DM

Handwritten signature of Doug Menz, dated 2/21/06.